ARMY-SPONSORED SCIENTISTS WIN NOBEL PRIZE

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Introduction

The most recent announcement of the Nobel Prize winners was especially meaningful to the Army Research Laboratory (ARL) because three of the six winners for physics and chemistry had been supported—beginning in the 1970s—by the extramural research arm of ARL, the U.S. Army Research Office (ARO). This brings ARO's "Nobel count" to more than 12!

The Nobel awards have drawn increasing public attention over many decades—perhaps disproportionate attention—like that of the Masters Tournament in Augusta, GA. But who wins the Masters and who gets the Nobels fascinates everyone. We just have to admit our fascination too. One thing is certain: there is no doubt that the research of Nobel laureates has had a dramatic impact on the U.S. Army.

Background

ARL's support of research leading to Nobel Prizes dates back 50 years, when ARL's research arm was located on the Duke University campus and was known as the Office of Ordnance Research (OOR). Back then, OOR coordinated with the U.S. Army Signal Corps in supporting and fostering research that led to discoveries underlying many of today's Army technology capabilities, such as the light amplification by stimulated emission of radiation (laser) and the portable atomic clocks used in the Global Positioning System. In fact, the Army-funded demonstration of microwave amplification by the stimulated emission of radiation (maser) was the key discovery that led to laser use in Army target-designation and range-finding systems.

In recognition of the maser demonstration, professor Charles H. Townes received the Nobel Prize in physics in 1964, "for fundamental work in the field of quantum electronics, which led to the construction of oscillators and amplifiers based on the maser-laser principle." This early research on the laser was extended to the nonlinear optics field by professor Nicolass Bloembergen, winner of the 1981 Nobel Prize in physics.

Among the early Nobel Prize winners supported by the Army are professors John Bardeen, Leon Cooper, and J. Robert Schrieffer. They shared the Nobel Prize in 1972 for developing the "BCS" theory of superconductivity (named by referencing the first letter of each last name).

In more recent times, ARO supported the research of professors Richard E. Smalley and Robert F. Curl, who were awarded the 1996 Nobel Prize in chemistry for their discovery of buckminsterfullerenes. ARO's support of Smalley's research, and that of Rice University collaborators such as Curl, occurred at a critical time in the sequence leading to their discovery of the fullerene series. This discovery resulted in an entire class of structures with novel electronic, optical, and materials properties. Army research is now using these new structures for future-ballistic protection and information-processing systems.

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The Nobel Prizes for 2000 recognize events that took place 20-30 years ago, a period during which many milestone science and technology events transpired. The Nobel Prize selections for 2000 for physics and chemistry also coincided with the influence of information technology on the global economy. No doubt that in the Nobel selection process, where committees canvas thousands of scientists throughout the world, many equally appealing scientific milestones continue to remain obscured from the public mind.

ARO, now part of the Army Research Laboratory (ARL-ARO), supported three American scientists who figured prominently in the first Nobel chemistry and physics awards of the new millennium: Alan Heeger, Alan MacDiarmid, and Herbert Kroemer. Indeed, they received substantial Army sponsorship for their research at various intervals during the past 26 years.

Heeger's application to the ARO in the summer of 1976 was presented in the framework of a "new class of synthetic metals ... to provide special materials properties unavailable to technological application." The Army readily agreed that understanding and controlling defects in these materials would be necessary for technological progress. Following this first Army support, Heeger and his University of Pennsylvania Chemistry Department colleague MacDiarmid initiated the collaboration with Japanese researcher Hideki Shirakawa. This collaboration resulted in the seminal research developments cited in the Nobel award. In later years, ARO also supported MacDiarmid independently in areas such as research on electrochromic and thermochromic polymer systems.

Kroemer detailed a research plan to ARO in 1973 to develop a quantitative theory of heterojunction discontinuities. Several semiconductor devices used in military systems are based on heterojunctions, including night-vision photodetectors, lasers and light-emitting devices for target illumination, and high-frequency radar and communication devices. Kroemer, now a professor at the University of California at Santa Barbara, has expressed gratitude to ARO for providing resources to purchase his first molecular beam epitaxy system, which enabled the early work for which he earned the Nobel Prize.

ARO celebrates its 50th anniversary in June 2001. A number of Nobel laureates will be attending the celebration, as Brown, Cooper, Esaki, and Townes did for ARO's 40th anniversary in 1991. In addition, an even larger number of Nobel laureates are expected to attend the June 2001 50th Anniversary Symposium and play key roles in its program.

Conclusion

Today, ARL is the home not only of ARO, but also of elements of the Army Signal Corps and the Army Ordnance Corps. Indeed, the Army has unified all of these great basic research organizations under the ARL, which continues to foster world-class research in a wide range of disciplines relevant to the Army. ARL's extramural research arm—the ARO—is working to ensure that the Army portfolio of research programs will continue to foster research discoveries worthy of the Nobel Prize.

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